are liable to inadvertently speak of a ball of lightning when they intend to speak of a bolt.

In his August report, Mr. J. Warren Smith gives a diagram illustrating a new feature in lightning flashes, as described by Mr. E. W. Dimock, Voluntary Observer at Dupont, Ohio:

When the flash occurred it divided at an altitude of about 20° above the horizon and from the junction of the two branches a bright red ball descended perpendicularly and slowly until lost to sight. A sharp clap of thunder followed in about four seconds.

FILLET OR RIBBON LIGHTNING.

Mr. J. Nelson Trask, under date of September 22 states that at New Salem, Franklin County, Mass., on September 2, 1898, he recorded a ribbon flash, which he calls a fillet flash, different from anything he had seen before. From among the many details given by him, relative to the thunderstorm of that afternoon we quote the following:

I never saw so many flashes shooting horizontally, slanting, or crooked, branched and filleted. The fillet was very curious, it fell sloping with short bright and dark bands alternating, like those of a stepping waterfall.

The zig-zag band sketched by Mr. Trask with its alternate bright and dark spaces would perhaps, if it had been photographed from nature, have appeared as simply one variety of twisted ribbons that are so well known. But while hazarding this conjecture, the Editor must acknowledge that if the zig-zag fillet really preserved its full width throughout and was built up of alternate bright and dark portions, as drawn by Mr. Trask, then we certainly have an entirely new type of lightning flash.

DISTANT LIGHTNING.

On Monday, September 4, a flash of lightning that seemed to have occurred over Salt Lake City, Utah, appears also to have been observed by Mr. James Clove, editor of the Provost Enquirer, who was at that time traveling in Piute County, 200 miles south of Salt Lake. Mr. Clove observed at 4:20 p. m. a most vivid flash of lightning among the dark clouds of the north. It seemed near by, but no thunder was heard. Piute is about 2,000 feet higher than Salt Lake City, and Mr. Clove asks whether it could possibly be that the flash witnessed by him was that which did so much damage in the latter city.

As Mr. Clove saw his lightning among the lower dark clouds of the north and as such clouds can not be seen many miles away, it is evident that this flash is not likely to have been identical with that over Salt Lake City. Even if the dark clouds that he saw comparatively near him had been absent, leaving only ordinary clear air between his station and Salt Lake City, still it is not likely that a flash over the latter city would have been visible as a vivid flash at Piute, since the brightest sunshine reflected from a mirror and observed with a large telescope can not be seen through 200 miles of dry dusty air. Flashes of sunlight are often sent as signals from one mountain top to another at a very great distance, but in such cases both observers must be on mountains so that the flash need not pass through the dusty air of the lowlands.

On the other hand, the lightning of an ordinary thunderstorm frequently illuminates the hazy and dusty air up to a height of several thousand feet and to a horizontal distance of many miles, so that an observer 200 miles away may detect the presence of a distant thunderstorm by the flashes known as heat lightning that are seen in the distant clouds above the horizon. But these flashes do not correspond to to the vivid flash among the clouds described by Mr. Clove.

If several observers 50 or 100 miles apart should keep a complete list of the exact bearing of every appearance of distant heat lightning and should draw the proper lines upon a map the intersections of these lines would, undoubtedly, give the exact locations of the storms themselves and thus contribute to complete our history of local thunderstorms.

Owing to the curvature of the earth and the refraction of the rays of light passing through the atmosphere, a point that to an observer at sea level appears to be exactly in the horizon, viz, 90° from the zenith, can not be on the earth's surface, but must be some distance above it. If the point is twenty miles away, it will be about 228 feet above sea level and if it is 200 miles away, it will be nearly 23,000 feet above sea-level. Its elevation in order to appear in the horizontal plane of the distant observer, is calculated by the rule that the elevation in feet is 0.571714 times the square of the distance in miles.

THE STORMS OF AUGUST 2.

A series of local destructive storms occurred on Wednesday, August 2, in several States from New York to Virginia. So far as the State of Maryland is concerned, Mr. F. J. Walz made an exhaustive collection of data and has published an excellent summary in the August report of the Maryland and Delaware sections. Although generally called a thunderstorm, yet many of the conditions peculiar to tornadoes were observed. Some observers noted a funnel shaped cloud formation, others heard the loud and continuous roaring sound, while at many points in Montgomery, Calvert, and St. Mary's counties the winds were tornadic in their nature. Mr. Walz's chart of greatest destruction by wind seems to show that we have to do with a series of local gusts and whirls rather than a single tornado. He says:

The weather chart of 8 a. m., August 2, renders the inference admissible that a secondary depression was formed in the area between Washington, D. C., Lynchburg, Va., Pittsburg, Pa., and Parkersburg, W. Va., and that the winds at each of these stations blew toward the center of this incipient cyclone, which by 3 p. m. had moved eastward to the region of greatest devastation.

The Editor, however, would suggest as equally plausible the following modification of this view. The westerly winds that cross the Alleghany and Blue Ridge blow down over the coastal plain from Virginia to New Jersey in such a way in the afternoon as to underrun and mix with the warmer and moister air that at that time of day overlies the lowlands. When this diurnal phenomenon is intensified by the cooperation of a properly located area of low pressure it invariably leads to the formation of large clouds and often a long series of local storms between 1 p. m. and 9 p. m. along the line of mixtures and ascensions. The atmospheric conditions may be such as to give rise to severe gusts of wind and possibly rain, hail, and lightning. Many such local storms may be in progress simultaneously; they may begin either at the northern or the southern end of the line. Each may move nearly parallel to its neighbors and toward the northeast or the southeast. Each is liable to be so small that we get observations of it from only one or two stations. Occasionally one or two of these storms will have tornadic severity and characteristics, others will be simply ordinary thunderstorms. It would be safer to look for such a series of storms rather than to attempt to explain all the observed phenomena of August 2 as due to one incipient cyclone.

The barometric oscillations during the passage of these storms of August 2 were quite remarkable and have been studied by Mr. H. H. Kimball in an article published in the current number of the WEATHER REVIEW. He confirms Prof. W. M. Davis's idea that the sudden rise of the barometer is largely due not to wind or rain or density of descending air, but to the rapid expansion of moist air in the process of

forming cumulus clouds. (Davis's Elementary Meteorology, page 263.)

AIR CURRENTS IN THUNDERSTORMS.

It is well known that in general a thundercloud is fed by currents of air flowing toward its center with a gentle ascending gradient that becomes very steep within the cloud itself. But the descending rain both by cooling the air through which it falls and by driving it downward, causes an outward wind near the ground and near the center of the thunderstorm. On August 5 Mr. Wm. A. Eddy, of Bayonne, N. J., sent up a small hot-air balloon at 4:15 p. m. as a heavy thunderstorm was approaching. After ascending vertically for 100 feet it was caught in the current that swept it toward the center of the storm and at the same time it rose until it was fully 2,000 feet above the earth and finally penetrated the cloud with falling rain. It was then driven downward and backward until it reached a point on the earth quite near its starting point. Two other similar experiments with the same results had been made by Mr. Eddy on July 22 and 27.

This is an interesting method of studying the currents of air in the atmosphere. It may not be wholly new, but is well worthy of frequent repetition.

ANCIENT TORNADO TRACKS.

In the August report of the Iowa Monthly Review, Messrs. Sage and Chappel reprint from the Davenport Democrat some account of several tornadoes that must have occurred years ago, whose existence and tracks are demonstrated by long lines of destruction in forests. Such tornado tracks were frequently investigated by Lieut. John P. Finley and included in his tables of tornadoes. The additional ones now recorded are as follows:

Several located by Mr. James E. Lindsay, of Davenport, and E. W. Durant, of Stillwater, in the neighborhood of Davenport. Also, several located by Lindsay in northwestern Wisconsin and Nebraska. The Comanche tornado of 1860. The tornado of Cedar County, June 5, 1854, located by Joseph Wright of Plato, Iowa, who says:

> The path of the storm was half a mile wide as it cut its way through the timber. Everything was taken clean—nothing left. When the storm crossed Cedar River it took large stones from the bottom and carried them on land. From the best information I could gather, this storm of 1854 must have reached Lake Erie.

There is no reason whatever to imagine that the tornado is a new phenomenon. It must have been just as common in North America 5,000 years ago as it is to-day. Every well-marked ancient tornado path that can still be recognized in the fallen timber, or a description of which can be obtained from ancient letters, newspapers, or local records should be put on record.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

The Smithsonian Institution desires two copies each of the MONTHLY WEATHER REVIEW for September, 1897, and September, 1898.

The Public Library at Sydney, New South Wales, desires a copy of the MONTHLY WEATHER REVIEW for November, 1895.

The Meteorological Observatory at Bremen, Germany, desires to obtain the complete years 1897 and 1898.

In general, it is best for those having copies to spare of the MONTHLY WEATHER REVIEW to send them to the Editor of the REVIEW and not to the person for whom the request is made, as in the latter case unnecessary duplicates accumulate on his hands.

THE SECOND WELLMAN EXPEDITION.

Mr. Evelyn B. Baldwin, of the Weather Bureau, who was granted a furlough to enable him to accompany the second Wellman expedition in the capacity of meteorologist, has very recently returned from Franz-Josef Land, and has resumed his duties in the Weather Bureau.

We are authorized by Professor Moore to announce that a report on the meteorological work of the expedition is now in course of preparation and that it will be published shortly by the Weather Bureau.

The region covered by the expedition was mainly between latitude 80° 05′ and 81° 20′ north and longitude 58° to 64° east. The report will include, in addition to hourly barograph and thermograph readings, twice daily eye observations of the clouds, as to amount, kind, and direction; wind movement by Robinson anemometer; observations of the aurora, and other natural phenomena.

Typical pressure and temperature curves, as well as those made during times of unusual atmospheric disturbances, will be reproduced in full. The material collected by Mr. Baldwin is not only interesting and valuable in itself, but also in its relation to the work of former expeditions, since it forms a connecting link between that of Dr. Blessing and Lieutenant Johannsen of the Nansen expedition, as well as that of the Jackson-Harmsworth expedition and work now being prosecuted in Franz-Joseph Land by the Italian expedition under command of Prince Luigi, duc d'Arbruzzi. His aurora work was complementary to that done by himself on the Peary expedition of 1893–94 in Greenland.—*A. J. H.*

A SUCCESSOR TO SENOR BARCENA.

The President of the Republic of Mexico has appointed Manuel E. Pastrana director of the Central Meteorologico-Magnetic Observatory at the City of Mexico as successor to the late Don Mariano Bárcena. The climatology of the Republic is committed to this Central Observatory, but the daily weather telegraphy, maps, and predictions are conducted by the Federal Department of Telegraphs. The stations of the latter organization are new and are in the telegraph offices and convenient to the business men of the Republic, but those of the Central Observatory represent the agricultural and educational interests.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV. The persistence of a West India hurricane off the coast of North Carolina, and the very low barometer readings during the prevalence of the storm explain the unusually low monthly means along the south Atlantic coast. Ordinarily pressure in August is highest on the south Atlantic and north Pacific coasts.

There was a very general decrease in pressure from July to